Department of Defense

INSTRUCTION

November 7, 1995
NUMBER 7041.3

USD(C)

SUBJECT : Economic Analysis for Decisionmaking

References : (a) DoD Instruction 7041.3, “Economic Analysis and Program Evaluation for Resource Management, “ October 18, 1972 (hereby canceled)
(b) Off ice of Management and Budget Circular No. A-94, “Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs, “ October 29, 1992
(c) DoD Directive 8120.1, “Life-Cycle Management (LCM) of Automated Information Systems (AICs) , “ January 14, 1993
(d) DoD Directive 5000.1, “Defense Acquisition, “ February 23, 1991
(e) through (i) , see enclosure 1

A. REISSUANCE AND PuRPOSE

This Instruction:

1. Reissues reference (a) to implement policy, and update responsibilities and procedures for conducting cost-effectiveness economic analysis for evaluating the costs and benefits of investment alternatives under reference (b) .

2. Continues to authorize the Defense Economic Analysis Council. The Council shall continue to pursue uniform economic policy throughout the Department of Defense, resolve any issues that may arise, and represent joint Service opinion to the Office of the Secretary of Defense. See enclosure 2 for a more detailed explanation of the Council’s charter and responsibilities.

B. APPLICABILITY AND SCOPE

This Instruction:

1. Applies to the Office of the Secretary of Defense (OSD), the Military Departments, the Chairman of the Joint Chiefs of Staff, the Defense Agencies, and the DoD Field Activities (hereafter referred to collectively as “the DoD Components”).

2. Applies to the evaluation of decisions about the startup research, acquisition, renewal, renovation, conversion, upgrade, expansion, pre-planned product improvement, leasing, or operations of all programs or projects under this Instruction. The adoption of such programs and projects is expected to commit the Government to a series of measurable expenditures or benefits

beyond the inception date.

3. Applies prescribed methodologies to all considerations for investment.

4. Applies to the evaluation of decisions about acquisition of the following:

a. The use of real property or other assets, such as by lease or purchase.

b. Automated information systems. (See DoD Directive 8120.1, reference (c) for supporting guidance.)

c. Weapons systems and weapons systems support. Analytic studies that deal with cost and effectiveness considerations in those areas are considered to be “economic analyses” (even though not specifically titled as such) and should adhere to the policy in section C., below. (See DoD Directives 5000.1 and 4275.5, references (d) and (e).)

5. Does not apply to decisions about the following:

a, Federal Energy Management Programs. (See 10 CFR 436a, reference (f).)

b. Commercial Activities. (Commercial-type services by Government or contractor operation). (See DoD Instruction 4100.33, reference (g).)

The Army Corps of Engineers Water Resource Projects (Guidancce’ for these projects is the approved economic and environmental principles and guidelines for water and related land resources implementation studies).

d. Programs or Projects that Involve Costs or Quantifiable Benefits Primarily External to the Federal Government Analyses for those types of programs or projects are addressed as “public investment and regulatory analyses” under OMB Circular A-94 (reference (b)). “Economic analysis” in this Instruction refers to programs and projects with costs and benefits that are primarily internal to the Federal Government.

c. POLICY

It is DoD policy that:

1. The concepts of economic analysis constitute an integral part of the Planning, Programming, and Budgeting System of the Department of Defense. (See DoD Instruction 7045.7, reference (h).)

2. Procedures in enclosure 3, at a minimum, must be followed by the DoD Components in economic analyses submitted to the Under

Secretary of Defense (Comptroller) (USD(C)) to support budgetline items exceeding the investment-expense criteria of DoD 7000.14-R (reference (i)).

3. A complete economic analysis should adhere to the procedures in enclosure 3 to support decisions based on life-cycle costs .

D. RESPONSIBILITIES

1. The Underscretary of Defense (Comptroller) shall:

a. Serve as primary point of contact to answer questions and other inquiries about this Instruction.

b. Ensure that the Defense Economic Analysis Council shall pursue uniform economic policy and procedure throughout the Department of Defense, resolve any issues that may arise, and represent joint Service opinion to the OSD, as in enclosure 2.

2. The Heads of the DoD Components shall ensure that policy and procedure regarding the use of economic analyses are implemented within their Components and shall present issues for resolution to the Defense Economic Analysis Council.

E. PROCEDURES

Procedures for economic analyses are in enclosure 3.

F. INFORMATION REQUIREMENTS

The method of documentation used to record and summarize cost and benefit information may vary between the DoD Components. The DoD Components are encouraged to “standardize,” when possible, format and documentation requirements to ensure consistent and complete economic analysis submissions. Automated information tools and data sources are encouraged to reduce paperwork and provide the audit trail.

G. EFFECTIVE DATE

This Instruction is effective immediately

Alice C. Maroni
Principal Deputy Undersecretatary
of Defense (Comptroller)

Enclosures - 3
1. References
2. The Defense Economic Analysis Council
3. Procedures for Economic Analysis

REFERENCES continued

(e) DoD Directive 4275.5, "Acquisition and Management of Industrial Resources, " October 6, 1980
(f) Title 10, Code of Federal Regulations, Part 436, "Federal Energy Management and Planning Program, " current edition
(g) DoD Instruction 4100.33, "Commercial Activities Program Procedures, " September 9, 1985
(h) DoD Instruction 7045.7, "Implementation of the Planning, Programming, and Budgeting System (PPBS), " May 23, 1984
(i) DoD 7000.14-R, "DoD Financial Management Regulation, " Volume 2, June 1993, authorized by DoD Instruction 7000.14, November 15, 1992

THE DEFENSE ECONOMIC ANALYSIS COUNCIL

A. The Defense Economic Analysis Council shall continue to serve in an advisory capacity to the USD(C) . That Council shall encourage DoD-wide application of the concepts contained in this Instruction in the planning, programming, and budgeting processes. It shall develop DoD-wide standardized format and documentation requirements and identify support tools to insure consistent, complete economic analysis submissions. It shall serve to also strengthen analytical capabilities throughout the Department of Defense.

B. The various offices of the Secretary of Defense, the Military Departments, and the Defense Agencies shall appoint competent representatives to the Council.

C. Council members shall be responsible for advising the USD(C) and their respective Services and Agencies on matters for the following:

1. Policies and procedures on the use of economic analysis and the application and revision of this Instruction.

2. Application of economic analysis in the planning, programming, budgeting, evaluation process, and other decision-making processes of the Department of Defense.

3. Techniques and methodology for justifying and supporting resource consumption decisions.

4. Educational programs for fostering and understanding of techniques of analysis and enhancing their usefulness to managers and operations personnel.

5. Improving the quality of analysis and strengthening analytical capabilities of the Department of Defense.

D. A Chair shall be approved by the USD(C) based on recommendations from the Council members.

PROCEDURES FOR ECONOMIC ANALYSIS

A. GENERAL PRINCIPLES

Economic analysis is a systematic approach to the problem of choosing the best method of allocating scarce resources to achieve a given objective. A sound economic analysis recognizes that there are alternative ways to meet a given objective and that each alternative requires certain resources and produces certain results. To achieve a systematic evaluation, the economic analysis process employs the following two principles:

1. Each feasible alternative for meeting an objective must be considered, and its life-cycle costs and benefits evaluated.

2. All costs and benefits are adjusted to "present value" by using discount factors to account for the time value of money. Both the size and the timing of costs and benefits are important.

B. ELEMENTS OF AN ECONOMIC ANALYSIS

A complete economic analysis of investment alternatives include the following elements:

1. Objective. The statement of the objective should clearly define and quantify (to the extent possible) the function to be accomplished. The statement of the objective should not assume a specific means of achieving the desired result. If such an assumption is made, the statement of the objective undermines the analytical purpose of the economic analysis by prejudging the result and should be avoided.

2. Assumptions. Base economic analysis on facts and data when possible. Since economic analysis deals with costs and benefits occurring in the future, assumptions must be made to account for the uncertainties.

3. Alternatives. Feasible ways of satisfying the objective must be documented and discussed. The recommendation resulting from the economic analysis shall come from the options evaluated. Careful attention must be given to identifying alternatives.

4. Costs and Benefits. The costs and benefits associated with each alternative under consideration should be quantified whenever possible, so they may be included in the economic analysis calculations. When quantification is not possible, the analyst should still attempt to document significant (qualitative) costs and benefits. Minimally, qualitative costs or benefits should be discussed in narrative format.

5. Comparison of Alternatives. Compare the costs and benefits of each alternative and rank them according to net present value.

6. Sensitivity and Uncertainty Analyses. The analyst should account for uncertainties in the analysis by testing the sensitivity of the economic analysis results to various factors. (For further information on “sensitivity analysis, " see attachment 1, below.)

7. Results and Recommendations. The economic analysis report should begin with a summary of the analysis (based on the benefits and costs of the alternatives), and an interpretation of the results (to include a recommendation of the preferred alternative) . The actual decision is based on qualitative as well as quantitative factors. The results of the economic analysis, including all calculations and sources of data, must be documented down to the most basic inputs to provide an auditable and stand-alone document.

c. IDENTIFICATION OF ALTERNATIVES

The purpose of the economic analysis is to give the decision-maker insight into economic factors bearing on accomplishing the objectives. Therefore, it is important to identify factors, such as cost and performance risks and drivers, that can be used to establish and defend priorities and resource allocations. The discussion of alternatives in the economic analysis shall determine which options to analyze.

1. The analyst must consider and document, minimally, each of the following alternatives:

a. Status quo or current functional baseline.

b. New acquisition or strategic functional performance objectives) .

c. Leasing. (See attachment 2, below)

d. Modification of existing assets to include: renovation, conversion, upgrade, expansion, or other forms of improvement of existing assets and/or services.

2. Alternatives must be fully investigated and a determination made whether the alternative satisfies the functional requirements for the project. Alternatives considered feasible are compared in the economic analysis. Alternatives dismissed as “infeasible” must be discussed, but need not be formally compared in the economic analysis. Aggressive pursuit of alternatives is strongly encouraged so innovative and improved ways of doing business are actively considered.

D. ANALYTICAL METHODOLOGY AND CRITERIA

1. Parameters. Besides discounting procedures, the treatment of inflation, and economic comparison criteria, an economic analysis of investment alternatives consists of basic parameters

necessary to account for how costs and benefits for each alternative are displayed, treated, and reported. Those basic parameters are summarized below:

a. Economic Life. The period of time when the benefits from an alternative are expected to accrue. The economic life is usually constrained by technological or mission life.

(1) Physical Life. The estimated number of years that an asset can physically be used in accomplishing the function for which it was intended.

(2) Mission Life. The estimated number of years over which the need for the asset is anticipated.

(3) Technological Life. The estimated number of years a facility or piece of equipment will be used before it becomes obsolete due to changes in technology.

b. Start Year. The first year in which an alternative incurs a cost or realizes a benefit. The start year is the first year of the period of analysis.

c. Lead Time. The period from the start year to the time that an alternative begins to produce benefits.

d. Period of Analysis. The mission life of the program or project plus the lead time.

e. Base Year. The year to which all costs and benefits are discounted.

2. Treatment of costs and Benefits. For each alternative, an economic analysis needs to identify the pertinent costs and benefits, estimate the magnitude of those costs and benefits, and estimate the timing of the costs and benefits.

a. Identification of costs and Benefits. Include all measurable costs and benefits to the Federal Government that are incident to achieving the stated objectives of the function. The costs and benefits will be exhaustive and may cover multiple government agencies and budgets. Define “costs” and “benefits” so they are mutually exclusive.

(1) Societal costs and benefits outside the Federal Government are usually not included in a DoD analysis. A project whose primary purpose is to produce benefits outside the Federal Government falls under OMB Circular A-94 (reference (b)), the paragraph entitled “Special Guidance for Public Investment Analysis. ”

(2) Sunk costs and realized benefits are not included in the comparison of alternatives. Sunk costs and realized benefits should be discussed in the assumptions for the analysis.

(3) When the magnitude and timing of a cost or benefit is identical for all alternatives, they can be considered as “wash costs” or “benefits.” Wash costs do not add any additional information to the decisionmaking process and may be excluded from the comparison. Caution should be taken when identifying “wash costs” to ensure that costs or benefits excluded are identical for all alternatives. Additionally, wash costs should not be excluded should there be a requirement to reflect the total program costs.

(4) Include the opportunity cost of assets and resources. Opportunity costs represent the alternative value foregone when an asset is used for other purposes. For example, if an alternative requires that the Government retain an asset, the opportunity cost would be the estimated value of the asset.

(5) Recurring Costs. Those costs incurred on a continuing annual basis to support the alternative. Those can often be grouped into such categories as “personnel,” “utilities,” “maintenance, " and “overhead, “ etc.

(6) Nonrecurring Costs. Often one time costs or costs that occur on an infrequent and intermittent basis.

(7) Imputed Costs. The analysis should incorporate, as costs, the value of any Federal services provided without charge to the project, for example; “ “base operating support. ” (See attachment 2, below, for other types of imputed costs.)

(8) Residual Values. Should be calculated for alternatives that have assets (buildings, equipment, and structures, etc.) that will still have useful value at the end of the period of analysis. That value should reflect the remaining worth of the asset(s) in question at the end of the period of analysis. Market appraisal for similarly-aged assets, appraisal guidelines, and depreciation schedules are all acceptable techniques. Land is an asset that is expected to appreciate, rather than depreciate, over time. Terminal value estimates for land can be based on a market study. If that is not feasible, assume land will appreciate at a real rate of 1.5 percent each year.

b. Estimation of Costs and Benefits. The adequacy or success of costing efforts depends primarily on establishing relationships between the attributes and the cost elements of an alternative. Cost estimating techniques establishing those relationships should be based on the amount and detail of data available as well as the time and resources at hand to develop the cost estimates. Cost estimating techniques fall into the three categories of ‘analogy, ” “parametric cost estimating, ” and “industrial engineering. ” The selection of a cost estimating technique determines the degree of confidence in a cost estimate and depends on the data available.

c. Timing of Costs and Benefits. Accounting for the time value of money is crucial to the conduct of an economic analysis. Economic analyses must accurately reflect the time when costs and benefits occur. A cost in an economic analysis shall be discounted in the year in which the Federal Government is expected to incur an expenditure; a benefit shall be discounted in the year in which the Federal Government expects to realize the benefit.

3. Treatment of Inflation. All budget estimates must be in current dollars. For analytical purposes, all estimates of the costs and benefits for each year of the period of analysis can be made in either of two ways as follows:

a. Constant dollars that measure costs and benefits for stable purchasing power; or

b. Current dollars that measure costs and benefits for future purchasing power of the dollar. In a single analysis, computations should not mix current and constant dollars.

4. Discounting. The discount rate to be used for conducting economic analysis in the Department of Defense is based on an estimate of the Government's costs of borrowing for the appropriate period of analysis. The proper discount rate to use depends on whether the costs and benefits are measured in current or constant dollars. If costs and benefits are expressed in constant dollars, then a real discount rate; i.e. , a nominal rate that has been adjusted to exclude expected inflation, should be used to calculate a net present value. If costs and benefits are measured in current dollars, then a nominal discount rate (which implicitly includes inflation) should be used to calculate the net present value.

a. The estimate of the discount rate for use in DoD economic analysis expressed either in real or nominal terms shall be issued annually by the USD(C) in accordance with guidance received from the Office of Management and Budget (OMB). That data shall be based on estimates of real and nominal borrowing rates provided by the OMB. (See attachment 3, below.)

b. Discount rates shall be based on an estimate of the expected cost of borrowing for 3-, 5-, 7-, 10-, and longer-term securities. Attachment 3 shows the procedures to use in applying the discount rates.

Attachments - 3
1. Sensitivity Analysis
2. Special Procedures for Leasing
3. Determining the Discount Rate for Performing Economic Analysis of Investment Alternatives

SENSITIVITY ANALYSIS

A. Uncertainty is always present in economic decisionmaking. Therefore, to determine the effects of uncertainties, a sensitivity analysis should be performed. Sensitivity analysis is a repetition of an analysis with different quantitative values for cost or operational assumptions to determine their effects for comparison with the results of the basic analysis. It is a tool that can be used for assessing the extent to which costs and benefits are sensitive to changes in key factors. Sensitivity analyses conducted on major unknowns for each feasible alternative can provide a range of costs and benefits that may provide a better guide or indicator than a single estimate.

1. A sensitivity analysis is basically a ‘what-if” exercise. It tests whether the conclusion of an economic analysis will change if a cost, benefit, or other assumed variable changes. Sensitivity analyses should always be performed as follows:

a. The results of the economic analysis do not clearly favor any one alternative.

b. There is uncertainty about an assumption that can impact the estimate of costs and benefits in the economic analysis.

c. Sensitivity analyses can be performed on all feasible alternatives by describing the approach and assumptions used for conducting the sensitivity analysis and describing the factors that have been determined to warrant sensitivity analysis. Examples of factors to consider are as follows:

(1) Assumptions. Consider the effects of alternative assumptions on the following:

(a) The project objective.
(b) Requirements.
(c) Operations.
(d) Discount rate.
(e) Inflation.
(f) Residual value.

(2) Period of Analysis. Consider the effects of a shorter or longer economic life.

(3) Costs and Benefits. Consider changes in the magnitude and timing of cost or benefits. Costs or benefits that significantly impact the total net present value of an alternative are good candidates for sensitivity analysis.

2. If a change in a variable or assumption causes a change in the ranking of alternatives, the economic analysis is said to

be “sensitive” to that variable or assumption. Performing a sensitivity analysis and including its results in the report provides a level of assurance that uncertainties have been tested and the results documented.

B. Sometimes a risk analysis can be justified. “Risk analysis” refers to probabilities of errors in the estimates or the probabilities of occurrence of events. Risk analysis deals with the probability and expectation of possible outcomes using probability concepts. The more explicitly the risk is defined, the greater the possibility for the decisionmaker to safely utilize the analysis, The probability results of available choices should be described definitively as possible. Many statistical and other tools exist so that a quantitative risk assessment can be made.

SPECIAL PROCEDURES FOR LEAS ING

A. The special guidance in this attachment applies only to analyses that include a feasible leasing alternative. All costs for both lease and purchase alternatives should be handled in a consistent and equitable fashion.

1. Coverage. This special guidance attachment applies when any of the following conditions is satisfied:

a. The asset is leased to the Department of Defense for a period of 3 or more years;

b. The asset to be leased is new, with an economic life of less than 3 years, and leased to the Department of Defense for a term of 75 percent, or more, of the economic life of the asset; or,

c. The asset is built for the express purpose of being leased to the Department of Defense; or,

d. The asset is leased to the Department of Defense and clearly has no alternative commercial use (e.g. , a special purpose Government installation).

2. Analytical Requirements and Definitions. When a DoD activity needs to acquire the use of a capital asset, it should do so in the way that has the least expensive life-cycle cost to the Government.

a. Life-Cycle Cost . If the set of alternatives includes both lease and purchase alternatives, the analysis should compare the net discounted present value of the life-cycle cost of leasing with the full cost of buying or constructing a comparable asset. The full costs of buying include the asset's purchase price plus the net discounted present value of any relevant ancillary services for the purchase and imputed costs.

b. Taxes. In analyzing the cost of a lease, the normal payment of taxes on the lessor's income from the lease should not be subtracted from the lease costs since the normal payment of taxes shall also be reflected in the purchase cost. The cost to the U.S. Treasury of special tax benefits, if any, associated with the lease should be added to the cost of the lease. Examples of such tax benefits might include highly accelerated depreciation allowances or tax-free financing.

c. Ancillary costs. If the terms of the lease include ancillary costs provided by the lessor, the present value of the cost of obtaining those services separately should be added to the purchase price. Examples of ancillary costs include the following:

(1) Repair and improvement costs (if included in lease payments).

(2) Operation and maintenance costs (if included in lease payments).

(3) Estimating Imputed Costs. Certain costs associated with the Federal purchase of an asset may not involve a direct monetary payment. Some of those imputed costs may be estimated, as follows:

(a) Purchase Price. An imputed purchase price for an asset that is already owned by the Federal Government, or which has been acquired by donation or condemnation, should be based on the estimated value of similar properties that have been traded on commercial markets in the same or similar localities. The same method should be followed in estimating the imputed value of any Federal land used as a site for the asset.

(b) Property Taxes. Imputed property taxes may be estimated in the following two ways:

1 Determine the property tax rate and assessed (taxable) value for comparable property in the intended locality. If there is no basis on which to estimate future changes in tax rates or assessed values, the first-year tax rate and assessed value (if costs are expressed in nominal dollars, inflation adjusted for each subsequent year) can be applied to all years. Multiply the assessed value by the tax rate to determine the annual imputation for property taxes.

2 As an alternative to subparagraph A.2.c. (3) (b)1 of this attachment, above, obtain an estimate of the current local effective property tax rate from the “Building Owners and Managers Association’s Regional Exchange Reports.” Multiply the fair market value of the Government-owned property (if costs are expressed in nominal dollars, inflation adjusted for each year) by the effective tax rate.

(c) Insurance Premiums. Determine local estimates of standard commercial coverage for similar property from the “Building Owners and Managers Association’s Regional Exchange Reports. ”

DETERMINING THE DISCOUNT RATE FOR PERFORMING ECONOMIC ANALYSIS OF INVESTMENT ALTERNATIVES

A. The discount rate for use in DoD economic analyses is based on the U.S. Treasury Department's cost of borrowing funds. Annually, the OMB issues an update of the borrowing rates based on the estimates provided in the President's budget submission. Typically, the update is issued in February and remains applicable until the next annual update. The following discount rates were issued on February 7, 1995 and are appropriate for use in all analyses until the next annual update:

Period of Analysis (In Years)		Constant Dollar	Current Dollar
At Least	But Less Than	Rate (Real)	Rate (Nominal)
	4	4.2%	7.3%
4	6	4.5%	7.6%
6	9	4.6%	7.7%
9	20	4.8%	7.9%
20		4.9%	8.1%

B. Future updates to these rates will be issued each year (per OMB Circular A-94, Appendix C (reference (b)) by memorandum from the Office of the USD(C).

C. The methodology for calculating end-of-year discount factors associated with the various discount rates is based on the following formula:

$$F_n = 1/(1+i)^n$$

where: F_n = the present value factor for year n
i = the discount rate
n = the project year

1. For example, the calculation of the discount factors for the 3 years of a 3-year project for constant dollars is as follows:

$$F_1 = 1/(1+.042)^1 = 0.9597$$
$$F_2 = 1/(1+.042)^2 = 0.9210$$
$$F_3 = 1/(1+.042)^3 = 0.8839$$

2. When costs and benefits occur in a steady stream, applying mid-year factors is best for the analysis. The formula for the calculation of the mid-year discount factors is as follows:

$$Fn = 1/(1+i)^{(n-.5)}$$

3. For example, the calculation of the midyear discount factors for the 5 years of a 5-year project using constant dollars is as follows:

$F_1 = 1/(1+.045)^{.5} = 0,9782$
$F_2 = 1/(1+.045)^{1.5} = 0.9361$
$F_3 = 1/(1+.045)^{2.5} = 0,8958$
$F_4 = 1/(1+.045)^{3.5} = 0.8572$
$F_5 = 1/(1+.045)^{4.5} = 0.8203$